Understanding maternal mortality in Colombia:

The influence of health insurance

Final Report

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Abstract

Background

In spite of a high coverage of institutional deliveries and prenatal consultations and the level of technological and hospital infrastructure, Colombia presents high levels of maternal mortality and important differences in maternal mortality ratios by insurance regime as well as regional and socioeconomic differences.

Objective

To establish whether the insurance regime and the contract modality (fee for service vs. capitation) are risk factors to suffer a severe obstetric complication in Bogotá and Antioquia.

To establish if the association between the insurance regime and the contract modality with the risk to suffer a severe obstetric complication is mediated by changes in quality of care, and timeliness of diagnosis and treatment.

Design

Analytical case-control study, paired by type of complication; two controls per case.

Case: a woman during pregnancy or 42 days after delivery that suffers one or more severe complications, including death due to one of the obstetric conditions that more frequently cause death: hemorrhage, preeclampsia or infection. It could be a postpartum, post abortion[1] or pos ectopic pregnancy[2], hemorrhage.

Control: a woman during pregnancy or 42 days after delivery that suffers one or more complications, due to one of the obstetric conditions that more frequently cause death: hemorrhage, preeclampsia or infection, but that did not comply with the defined criteria for "severe complications".

The study included 1011 women, 337 cases and 674 controls (two per case) paired by type of complication.

Variables

Dependent: obstetric morbidity.

Independent: insurance regime, mechanism of payment (capitation/fee for service), quality of care (timely and appropriate diagnosis and timely and appropriate treatment), age, civil status, zone of residence (urban/rural), educational level of patient, educational level of companion, previous

[1] **Abortion:** termination of pregnancy before the 22nd week. Spontaneous and induced cases are included.

[2] **Ectopic pregnancy**: pregnancy located outside the uterus.

obstetric history (cesarean, stillborns, abortion), preexistent medical conditions (hypertension, cardiovascular disease, mental disease, diabetes, collagen disease, urinary tract infection), body mass index, prenatal controls.

Results

An association was found between the insurance regime with the risk to suffer a severe obstetric complication (SOC) or a maternal death (MD), in which the contributive shows worse than the subsidized and non-insured (OR subsidized/contributive = 0.64; IC: 0.49-0.83, OR non-insured/contributive = 0.69; IC: 0.50-0.95).

An untimely diagnosis was associated with the risk of a SOC (OR=1.77; IC: 1.16-2.72); however, no association was found with a correct diagnosis or with a correct or opportune treatment.

No association was found with the payment mode. No association was found with age, civil status, socioeconomic status, body mass index, cardiovascular disease, hypertension, diabetes, number of prenatal controls, nor time at first prenatal control.

Conclusions

- The contributive regime must be audited and the maternal attention provided by this regime must be improved consequently
- The attention provided to pregnant women by all regimes should be adjusted to produce a timely diagnosis, and a better training of the health personnel must be given in order to correctly identify medical conditions that pose a risk of death in the pregnant woman.

Key words: severe maternal morbidity, risk factors, health insurance regimen, payment modality, case-control study, Colombia.

Contents

The research problem

Maternal mortality in Colombia continues at high level in spite of the increased coverage of health insurance and the high percentage of prenatal care visits and institutional deliveries in charge of physicians and nurses. According to official statistics, the average level of health insurance coverage is approximately 90 per cent.

According to Profamilia's 2005 study on Demography and Health 90.7 per cent of deliveries were assisted by doctors or nurses in hospitals and 93.5 per cent of expectant mothers attended prenatal monitoring. By 2010 these figures increased to 95% of deliveries assisted by doctors or nurses (93% by doctors and 2% by nurses).

The maternal mortality ratio in Colombia was of 68 deaths per 100.000 live births in 2005. It was 67 in Bogotá and 64 in Antioquia in the same year. Maternal mortality was lower for women under the contributive health insurance scheme and higher for those in the subsidized insurance and for the uninsured. It was higher in the rural zones, and in the less educated women.

The question posed is whether the observed differences between the insurance regimes are due to differences in women characteristics or to differences in the care received.

The low number of maternal deaths makes it difficult to obtain a sample size with enough power to proof the hypotheses what lead us to select as a proxy those cases with severe pregnancy, partum and post partum complications on the assumption of their association with maternal deaths.

This decision was based in part on the available evidence[i],[ii],[iii] over the association between maternal deaths and the presence of complications and on the fact that the complications are more frequent (10%) what provides us with more efficiency, been able to have a sample size with more power.

Table # 1

Number of maternal deaths and mortality ratio per 100.000 live births.

Antioquia (2006, 2007) and Bogotá (2005, 2006) per insurance regime.

Insurance regime	Bogotá				Antioquia			
	2005		2006		2006		2007	
	Deaths	Ratio x 100.000 newborn	Deaths	Ratio x 100.000 newborn	Deaths	Ratio x 100.000 newborn	Deaths	Ratio x 100.000 newborn
Contributive	25	39,7	18	27,4	16	45.59	8	22,6
Subsidized	24	88,2	28	106,3	29	68.63	16	56,8
Uninsured	13	70,8	8	44,6	13	109.70	13	52
Other/no info	5		6		1		2	
TOTAL	67	59,6	60	52	59	63,6	39	42,9

We pretend to identify if care of cases with pregnancy, partum and postpartum complications has the same opportunity and quality in severely and non severely complicated patients, and whether the characteristics of this care are associated with insurance regime and contract modality after controlling for socioeconomic level, education, health conditions and obstetrical history.

Objectives

General:

To establish whether the insurance regime and the contract modality (fee for service vs. capitation) are risk factors to suffer a severe obstetric complication in Bogotá and Antioquia.

To establish if the association between the insurance regime and the contract modality with the risk to suffer a severe obstetric complication is mediated by changes in quality of care, and timeliness of diagnosis and treatment.

Specific objectives:

1. Describe socioeconomic characteristics, educational level, obstetric history and health status of women with pregnancy, partum and postpartum complications by insurance regime and contract modality.
2. Establish if there is any relationship between quality and opportunity of care and insurance regime and contracting modality.
3. Establish the existing relationship between quality and opportunity of care and severe and non severe obstetric complications in Bogotá and Antioquia controlling by women's socioeconomic characteristics and obstetric history.

Methodology

Design

Case-control study, paired by type of complication, two controls per case.

Population and sample

The study population was composed by women with pregnancy, partum and postpartum complications (hypertension, obstetric hemorrhage and infection), admitted for care in hospitals of Bogotá and Antioquia with at least 1000 deliveries per year. Case selection was carried out until completing the sample size. The hypothetical cohort was that of all pregnant women in the two regions with severe and non severe obstetric morbidity consulting hospitals.

All hospitals in Antioquia and Bogotá with 1000 or more deliveries per year were selected. These are second and third levels of complexity hospitals that concentrate the care of women with obstetric complications. Selection was done prospectively for all women either admitted with severe complications or developing them while hospitalized (cases)

For every selected case, two controls were randomly selected among the pregnant women admitted with the same type of complication (not severe) or that developed it once hospitalized in any of the study hospitals in the corresponding region (Bogota-Antioquia).

A sample size was estimated to detect at least a RR of 2.0 with probabilities for errors type I and II of 5% and 20%, respectively. Given the prevalence of exposition in Bogotá of 23.2% (subsidized regime) and in Antioquia of 12.7% (uninsured), a sample of 200 cases in Antioquia and 141 cases in Bogotá was defined, with an increment already included to correct for the confounding variables considered.

Cases:

We defined "case" as a woman during pregnancy or 42 days after delivery that suffers one or more severe complications, including death due to one of the obstetric conditions that more frequently cause death: hemorrhage, preeclampsia or infection. It could be a postpartum, post abortion[3] or pos ectopic pregnancy[4], hemorrhage. (Table 1)

Controls:

We defined "control" as a woman during pregnancy or 42 days after delivery that suffers one or more complications, due to one of the obstetric conditions that more frequently cause death: hemorrhage, preeclampsia or infection, but that did not comply with the defined criteria for "severe complications". (Table 2)

Maternal death:

Any death of a pregnant woman or 42 days after delivery independent of pregnancy duration or location, due to hemorrhage, pregnancy associated hypertensive syndrome or sepsis.

Table # 2

Criteria for case and control identification

Cases *Severe Complications*	**Controls** *Non severe Complications*
1. Hypertensive syndrome **Complicated Preeclampsia** Patients with positive proteinuria (≥300mg/day) and blood pressure of 140/90 or more and any of the following criteria: • Pulmonary edema • Acute respiratory dysfunction: intubation or ventilation for more than 60 minutes, non related with an anesthetic act or oxygen saturation less than 90% for more than 60 minutes. • Cerebrovascular accident (hemorrhage or thrombosis) • Acute renal failure: urea >240 mgs. per dcl. or creatinine > 4.5 mgs per dcl. or need of hemodialisis. • Cardiac arrest	2. Hypertensive syndrome **Preeclampsia** Woman with more than 20 weeks pregnancy, positive proteinuria (≥300mg/day) and 140/90 of blood pressure or more.

[3] **Abortion:** termination of pregnancy before the 22nd. week. Spontaneous and induced cases are included.

[4] **Ectopic pregnancy**: pregnancy located outside the uterus.

• Hepatic failure: AST or ALT > 200 units per liter • Eclampsia	
1. <u>Severe obstetric hemorrhage</u> Patient that before, during or after delivery fulfills any of the following criteria: Need of transfusion of 4 units or more of blood cells during an acute hypovolemia episode. Need of treatment for coagulopathy: need of fresh frozen plasma, crioprecipitated or platelets. • Need of surgical procedure for treating the cause of hemorrhage (laparotomy, hysterectomy, B-Lynch or a second curettage after evacuating abortion or reintervention after laparotomy or laparoscopy for ectopic pregnancy)	<u>Obstetric hemorrhage</u> Patient that before, during or after delivery presents profuse bleeding qualified as obstetric hemorrhage by the treating physician.
2. <u>Severe sepsis</u> Patient with an infection secondary to an obstetric event (delivery, abortion or ectopic) that fulfills two or more of the following criteria: • Body temperature >38 or <36 ^{0}C • Cardiac frequency >90 per minute • Respiratory frequency >20 per minute or PaCO2 > 32 mg Hg. • White cell count >12,000 or <4,000, or more than 10% immature forms. • Bacteremia (positive blood culture) Associated with any of the following: • Acute respiratory dysfunction: orotracheal intubation or ventilation larger than 20 minutes, not related to an anesthetic act, or oxygen saturation <90% for more than 60m minutes. • Renal failure: urea >240 mgs. Per dcl. or creatinine > 4.5 mgs. per dcl. or need of hemodialisis. • Cardiac arrest • Hepatic failure: AST or ALT > 200 units per liter • Need of surgical procedure (exploratory laparotomy, hysterectomy, anexohysterectomy or a second curettage after evacuating abortion or reintervention after laparotomy or laparoscopy for ectopic pregnancy) • Death due to sepsis	3. <u>Sepsis</u> Patient with an infection secondary to an obstetric event (delivery, abortion or ectopic) that fulfills two or more of the following criteria: • Body temperature >38 or <36 ^{0}C • Cardiac frequency >90 per minute • Respiratory frequency >20 per minute or PaCO2 > 32 mg Hg. • White cell count >12,000 or <4,000, or more than 10% immature forms. • Bacteremia (positive blood culture) Abortion

Table # 3

Variables:

Type of factor	Source of information	Variable	Code
Identification	Coordination	Identification of triad case-controls	Sequential
	Patient interview (E.G)	ID	Number
	Clinical Record (CR.)	Clinical Record	Number
Group	Coordination/H.C.	Case /Control	0: control/ 1: case
Residence	Patient interview	Area-municipality	National Planning Department list
	Patient interview	Zone	1: Urban/ 2: Rural
Personal data	Clinical Record	Civil status	1: Married 2: Bachelor 3: Widow 4: Live together 5: Other
		Age	Number of years
Characteristics of complication (cases)	Clinical Record	Time of complication	1. Before admission to first institution 2. After admission to first institution
	Clinical Record	Type of complication	1. Hypertensive Syndrome 2. Hemorrhage 3. Sepsis
	Clinical Record	Death	1: yes /0:no
Death cause	Clinical Record	Basic cause	IDC code
	Clinical Record	Direct cause	IDC code
	Clinical Record	Associated cause 1	IDC code
	Clinical Record	Associated cause 2	IDC code
Insurance	Clinical Record	Insurance regime	1. Contributive 2. Subsidized 3. Special or Exceptional 4. Uninsured 9. No information
Form of payment	Clinical Record	Forms of payment between insurer (EPS) and provider (IPS)	1. Capitation 2. Fee for service 3. Other 4. NA 9. No information
Obstetric History	E.G.	Previous pregnancies	Number
	E.G.	Previous abortion	Number
	E.G.	Normal deliveries	Number
	E.G.	Cesarean	Number
	E.G.	Live born	Number
	E.G.	Still born	Number

	E.G.	Intergenesic interval	Number of months
Personal risk factors	Clinical Record	Diabetes (previous or concomitant)	1: yes /0:no
	Clinical Record	Hypertension (previous or concomitant)	1: yes /0:no
	Clinical Record	Cardiovascular Disease	1: yes /0:no
	Clinical Record	Collagen Disease	1: yes /0:no
	Clinical Record	Urinary tract infection during this pregnancy	1: yes /0:no
	Clinical Record	Mental disease diagnosed during this pregnancy	1: yes /0:no
	Clinical Record	Other, Which? ……	
	Clinical Record	Body Mass Index: (beginning of pregnancy)	
	Clinical Record	- Height	Centimeters
	Clinical Record	- Weight	Kilos
Quality of care	Clinical Record	Nº of prenatal controls	Number
	Clinical Record	Gestational age at first control (week)	Number
	Clinical Record	Gestational age at beginning of complication	Number
	Clinical Record	Person directly involved in care of initial complication	1: Empirical midwife 2: Nurse auxiliary 3: Professional Nurse 4: General practitioner 5: OBGn 6: Other 9: NA
		Time initial care of complication started	Time 7:01am a 7:00pm 7:01pm a 7:00 am
		Day of week	1:M, 2:Tu, 3:Wed, 4:Th, 5:F, 6:Sat, 7:Sun
		Timely diagnosis	1: yes /0:no
		Correct diagnosis	1: yes /0:no
		Timely treatment	1: yes /0:no
		Correct treatment	1: yes /0:no
		Time referral was ordered	
		Time referral was done	
	E.G.	- Transportation difficulties for referral and counter referral	1: yes /0:no/ 8: NA
		– How many health institutions visited in the 72 hours before admission?	Number
		Lack of supplies	1: yes /0:no
		(Drugs, blood, etc.)	1: yes /0:no
Educational level	E.G.	Educational level of patient	0: illiterate 1: Primary incomplete 2: Primary complete 3: High school

			incomplete 4: High school complete 5: Technical or University incomplete 6: Technical or University complete or more 9: No information
Socioeconomic stratum*	E.G.	Educational level of husband or companion	0: illiterate 1: Primary incomplete 2: Primary complete 3: High school incomplete 4: High school complete 5: Technical or University incomplete 6: Technical or University complete or more 9: No information
	E.G.	Household characteristics	
		- Nº of persons	Number
		- Nº of bedrooms	Number
		- Kind of floor	1: earth 2. cement 3: Wood or mosaic
	E.G.	Public services stratum	1,2,3,4,5,6, 8 (other) and 9 No information
Other		Complexity level of institution were complication was originated	Número
		Complexity level of institution were complication was resolved	
	H.C.	Type of obstetric event	1: normal delivery 2: cesarean 3: abortion 4: ectopic

Quality control

Quality control was done at four different moments:

1. Both the questionnaire and the instructive for data collection were pilot tested
2. A supervisor was in charge of reviewing the data collected. All collected formularies were reviewed.
3. The technical review done by an expert committee did an additional review and made sure that the cases and controls fulfilled the require criteria.

4. A 10% sample of the Bogotá technical reviews was checked by the Antioquia experts to assure that technical review criteria were comparable in both locations.
5. Once built the data basis was checked for consistency

Project activities

Two project teams were organized; one in Medellín, in charge of Antioquia information, and the other in Bogotá.

The two teams carried out a series of joint meetings[5] in order to agree on the methodological and logistic aspects. During project implementation additional coordination meetings took place alternatively in Bogotá and Medellín.

Two final joint meetings took place in Medellín for data analysis.

All methodological aspects were equal in both locations, but logistics were different and experienced difficulties likewise.

Antioquia:

The Antioquia team was headed by the study codirector (D.J. Gómez) and counted with the support of an OBGn epidemiologist (J.J. Zuleta), a master of Public Health student and a field coordinator. It was located at the University of Antioquia, Nacer group.

Antioquia's participation was conditioned to the Department's Secretariat of Health agreeing to it. Since project initiation coincided with a political change in its direction this implied a serious delay to start.

A negotiation was required in Antioquia with each participating hospital. This was a long and difficult process that implied important additional delays in execution. Once hospitals approved participation, a responsible nurse in each hospital was trained by the project team.

Nurses identified the patients (cases and controls), filled out the formularies and sent them out to the project team. This reviewed them and decided whether they fulfilled the criteria for cases for controls.

Accepted cases and controls were analyzed by the technical review team that made the final decision for inclusion or exclusion.

A data basis was built and quality control was done to it for consistency and accuracy.

Bogotá:

[5] See previous reports

The Bogotá team was a mixed one composed of ASSALUD researchers and Secretariat's of Health functionaries. It was headed by the study director (F.J. Yepes) and counted with the support of the senior research associate (LH Sánchez), the quality field coordinator assistant (ML Ramírez), the head of Public Health Surveillance (MP González), a nurse coordinator (MT Espitia) and five nurses in charge of directly collecting data in the participating hospitals.

Patients (cases and controls) were initially identified by hospital nurses (previously trained by our team) that directly reported to one of the five nurses in the central team.

These nurses visited the participating hospitals and did the data collection. All formularies were checked for consistency and completeness by the quality field coordinator.

(The five nurses and two OBGns for the technical review were a counterpart of the Secretariat of Health. There were administrative problems with the continuity of their contracts what resulted in additional project delays completely out of the control of the project team.)

Accepted cases and controls were analyzed by the technical review team that made the final decision for inclusion or exclusion.

A 10% sample of finally accepted cases and controls was checked by the Antioquia team to assure consistency between the two technical review teams. The Kappa statistic was utilized with a concordance of 0.81

A data basis was built and quality control was applied to it for consistency and accuracy.

Project outputs

A master of Public Health thesis was done as part of the project.

A policy paper was written for FOCAL (Canada)
http://www.focal.ca/images/stories/pdfs/Health_Reduction%20of%20maternal%20mortality%20in%20Colombia_%20Yepes_October%202010_e_sm.pdf

Project outcomes

A total of 1011 patients were collected, 337 cases and 674 controls between January 2009 and December 2010: 196 cases y 392 controls in Antioquia and 141 cases y 282 controls in Bogotá. Out of the total, 477 (47. 2%) had preeclampsia, 381 (37. 7%) had obstetric hemorrhage and 153 (15. 1%) sepsis.

Analysis of outcomes

We utilized descriptive measures such as central tendency and dispersion measures. For the association analysis we utilized the Chi Square and the exact Fisher with a one tail 5% significance

level. In a first approach we utilized the conditional logistical regression; however, as the results did not differ from those obtained with the unconditional logistical regression and were more imprecise, we stayed with the ones obtained with the latter.

Average age was 27.01 years (SD=7.27) for cases and 26.04 years (SD=7.08); 35 for controls; 35 cases (10.4%) came from rural area and 32 (4.75%) of controls; 101 cases (30.0%) and 204 (30.3%) of controls had no stable companion; 41.8% of cases (141) and 45.5% of controls (307) had not had previous deliveries. (Table #1)

Table 4. Demographic and obstetric characteristics of cases and controls

Characteristics		Cases (337)	Controls (674)
Age (years) (SD)		27.01 (7.27)	26,04 (7,08)
Civil Status	Married	88 (26.1%)	157 (23, 3%)
	Bachelor	101 (30.0%)	204 (30, 3%)
	Common Law	148 (43.9%)	313 (46,4%)
Area	Urban	302 (89.6%)	642 (95,3%)
	Rural	35 (10.4%)	32 (4,7%)
Educational level (woman)	Primary complete or less	46 (18.7%)	65 (14,0%)
	High school	109 (44.3%)	267 (57,5%)
	Technical or more	91 (37.0%)	132 (28,4%)
Educational level (father)	Primary complete or less	45 (20.8%)	59 (14,8%)
	High school	99 (45.8%)	231 (58,0%)
	Technical or more	72 (33.3%)	108 (27,1%)
Socioeconomic stratum	1 y 2	161 (67.6%)	293 (67,2%)
	3 y 4	69 (29.0%)	133 (30,5%)
	5 y 6	8 (3.4%)	10 (2,3%)
Insurance regime	Contributive	183 (54.3%)	310 (46,0%)
	Subsidized	99 (29.4%)	235 (34,9%)
	Uninsured	55 (16.3%)	129 (19,1%)
Previous cesarean	Yes	65 (19.3%)	88 (13,1%)
	No	272 (80.7%)	586 (86,9%)
Previous stillborn	Yes	13 (3.9%)	12 (1,8%)
	No	324 (96.1%)	662 (98,2%)
Previous pregnancies	0	141 (41.8%)	307 (45,5%)
	1	84 (24.9%)	167 (24,8%)

	2	50 (14.8%)	85 (12,6%)
	3 or more	62 (18.4%)	115 (17,1%)
Intergenesic period	No previous deliveries	141 (41.8%)	306 (45,4%)
	1-24 months	41 (12.2%)	72 (10,7%)
	≥ 25 months	155 (46.0%)	296 (43,9%)
Prenatal consultations	0	53 (18.8%)	87 (14,6%)
	1-4	79 (28.0%)	161 (27,0%)
	≥ 5	150 (53.2%)	348 (58,4%)
Weeks at first control	0-12	133 (66.2%)	312 (68,1%)
	13-20	50 (24.9%)	100 (21,8%)
	≥ 21	18 (9.0%)	46 (10%)
Weeks at initiation of complication	≤ 30	91 (30.2%)	173 (27,5%)
	31-36	99 (32.9%)	183 (29,1%)
	≥ 37	111(36.9%)	273 (43.4%)

In the univariate analysis the following variables showed a significant association with the effect:
zone (rural/urban): OR=2.33; CI 90%: 1.53-3.53,
insurance regime (subsidized/contributive): OR=0.71; CI 90%: 0.56-0.92,
insurance regime (uninsured/contributive): OR=0.71; CI 90%: 0.53-0.98,
previous cesarean sections: OR=1.59; CI 90%: 1.19-2.14,
previous stillborns: OR= 2.21; CI 90%: 1.14-4.32,
collagen disease: OR=4.74; CI 90%: 1.52-14.84,
woman's educational level (High school /technical or more): OR=0.59; CI: 0.44-0.79,
correct treatment: OR=1.62; CI: 1.26-2.09,
timely treatment: OR=1.38; CI: 1.08-1.78,
correct diagnosis: 0R=1.41; CI: 1.06-1.86,
timely diagnosis: OR=2.09; CI: 1.48-2.95.

In the same analysis we did not find a significant association of the effect with the following variables: age, civil status, socioeconomic status, body mass index, cardiovascular disease, hypertension, diabetes, number of prenatal controls and time of first prenatal control.

Table 5 shows the results of a logistic multivariate analysis that was done to test the hypothesis of the study. In relation to the insurance regime, it turned out that the subsidized and non-insured showed a significant lower risk than the contributive, with estimated odds ratios equal to 0.64 and 0.69, respectively, and confidence intervals that exclude de unity. We were not able to find an association between payment mode and Severe Obstetric Morbidity (SOM), with a confidence interval for the OR equals to 0.71 and 1.33. In those results referring to the quality of medical attention assessed as timely and correct diagnosis and treatment, only the ones pertaining to the timely diagnosis were statistically significant, with odds ratio equals to 1.77 and confidence interval 1.16-2.72.

In the same Table, results pertaining to the previous number of cesarean sections, collagen disease and zone of residence (rural/urban) were significant, with estimated OR's equal to 1.46, 5.13 and 2.68, respectively. With respect to the results obtained in the zone of residence variable is necessary to point out that all the rural participants included were from the Antioquia region as all participants of Bogotá were living in the urban sector.

Table 5.
Results of a logistic multivariate analysis in which the severe obstetric complication was treated as the outcome.

Variable	OR	90% CI		Significance
		Lower	Upper	
Regime				
Regime (Subsidized/Contributive)	.641	.493	.834	.005
Regime (Non-insured/Contributive)	.692	.503	.951	.057
Payment mode	.969	.706	1.329	.869
Number of previous cesareans	1.460	1.076	1.981	.041
Untimely diagnosis	1.772	1.156	2.716	.027
Correct diagnosis	1.091	.770	1.546	.680
Timely treatment	1.004	.720	1.401	.983
Correct treatment	1.318	.955	1.817	.158
Collagen disease	5.133	1.622	16.247	.020
Zone of residence (Rural/Urban)	2.680	1.727	4.159	.000

In a complementary multivariate analysis in which the 878 cases with information available in the number of prenatal controls variable were included, significant results were obtained when the 1-4 category was compared to the 0 reference category, with estimated OR equals to 1.47 and a confidence interval equals to 1.04-2.08; no significant results were obtained in the 5 or more controls category.

Overall assessment and recommendations

The results we present here correspond to the aggregate data of Bogotá and Antioquia. We would be doing separate analysis of the two regions at a later stage.

We could not prove our null hypotheses. We found no association between severe maternal morbidity and payment mode. On the other hand we found that been affiliated to the subsidized regime or not having insurance played a protective effect. This finding contradicted what we had observed at the initiation of the study. It very likely corresponds to the effect of a policy that lead to a careful review of every maternal death and a close scrutiny of the subsidized and non insured pregnancies what was not done with those in the contributive regime.

The variables that increased the risk of a severe morbidity were of three kinds.

1. Those related with health conditions of women: Having a history of previous cesarean sections, having a collagen disease
2. Those related with social conditions of women: Living in a rural zone
3. Those related with the health system: Insurance regime, quality of care

Except for the insurance regime, these findings are not unexpected.

The importance of quality of care supports a recommendation to improve the training of physicians for diagnosis and treatment of obstetrical complications.

Dissemination Plan

We plan to prepare at least two articles to be published in a national and an international journal.

One of them would be devoted to the presentation and analysis of the aggregate results of Bogotá and Antioquia and the other to a comparative analysis of Bogotá and Antioquia.

These articles would be prepared and presented for publication during the first semester of 2012

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